Contribution ID: **46** Type: **Poster**

Analysis of electron beam parameters and comparative study of electron beam capture for the Laser-Plasma-Accelerator-based EUV-FEL

The LINAC-based Free Electron Lasers, which is known as the fourth generation of synchrotron radiation sources, provide an intense source of brilliant X-ray beams for the worldwide user community to investigate matter at the atomic scale with unprecedented time resolution. In the frame of this presentation, we explore the development of a novel compact LASER-PLASMA-Accelerator (LPA)-based Free-Electron laser (FEL) operating in the extreme ultraviolet (EUV) range of the radiation spectrum. However, achieving the desired electron beam parameters within a single-unit Swiss-FEL type undulator (as a commercially available option) presents a significant challenge.
The presentation will cover the essential requirements of the LPA-based electron beam parameters for the LPA-based FEL and various options for capturing electron beams from a compact laser-plasma accelerator to reach the saturation of the FEL power. The focus will be on minimizing the dilution of the normalized transverse RMS emittance, which is a critical parameter for high-quality FEL radiation. By addressing these challenges, this research aims to pave the way for a compact and powerful EUV light source utilizing laser-plasma accelerator technology.

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Session Classification: Poster Session & Industry Display